

Emissions of Greenhouse Gases in the United States 2005

Table 15. U.S. Methane Emissions from Anthropogenic Sources, 1990, 1995, and 1998-2005

Source	1990	1995	1998	1999	2000	2001	2002	2003	2004	P2005
Million Metric Tons Carbon Dioxide Equivalent										
Energy Sources										
Coal Mining	97.7	83.8	75.6	71.5	68.1	68.0	64.1	64.2	67.3	65.5
Natural Gas Systems	128.9	137.6	143.9	144.2	151.0	147.0	154.0	153.2	154.7	154.0
Petroleum Systems	29.9	26.9	25.5	24.0	23.8	23.7	23.5	23.3	22.3	21.1
Stationary Combustion	12.9	11.8	8.9	9.3	10.0	8.7	8.9	9.3	9.5	9.7
Mobile Sources	5.6	4.8	4.7	4.6	4.6	4.5	4.4	4.2	4.4	4.5
Total Energy Sources	275.0	264.9	258.6	253.7	257.5	251.9	255.0	254.1	258.3	254.9
Waste Management										
Landfills	237.3	204.9	170.9	162.4	155.4	147.8	146.7	148.7	148.8	155.7
Wastewater Treatment	13.2	14.2	14.7	14.8	15.0	15.2	15.3	15.5	15.6	15.8
Total Waste Management	250.6	219.1	185.6	177.2	170.3	162.9	162.0	164.2	164.5	171.5
Agricultural Sources										
Enteric Fermentation	119.6	124.4	117.2	117.3	116.3	115.1	115.8	116.1	114.2	115.6
Animal Waste	43.5	49.9	53.6	52.7	52.8	53.3	53.7	54.2	54.7	55.3
Rice Cultivation	9.3	10.2	10.7	11.5	10.2	10.7	10.2	9.8	10.9	10.9
Crop Residue Burning	1.0	1.0	1.1	1.1	1.1	1.1	1.0	1.2	1.3	1.2
Total Agricultural Sources	173.4	185.4	182.6	182.5	180.4	180.3	180.7	181.3	181.1	183.0
Industrial Processes	2.7	3.0	3.1	3.1	2.9	2.5	2.6	2.6	2.7	2.5
Total	701.7	672.5	629.8	616.5	611.2	597.7	600.2	602.2	606.5	611.9
Million Metric Tons Methane										
Energy Sources										
Coal Mining	4.25	3.64	3.29	3.11	2.96	2.96	2.79	2.79	2.93	2.85
Natural Gas Systems	5.60	5.98	6.26	6.27	6.57	6.39	6.70	6.66	6.73	6.70
Petroleum Systems	1.30	1.17	1.11	1.04	1.03	1.03	1.02	1.01	0.97	0.92
Stationary Combustion	0.56	0.51	0.39	0.41	0.43	0.38	0.39	0.41	0.41	0.42
Mobile Sources	0.24	0.21	0.20	0.20	0.20	0.20	0.19	0.18	0.19	0.20
Total Energy Sources	11.96	11.52	11.24	11.03	11.20	10.95	11.09	11.05	11.23	11.08
Waste Management										
Landfills	10.32	8.91	7.43	7.06	6.75	6.42	6.38	6.47	6.47	6.77
Wastewater Treatment	0.58	0.62	0.64	0.65	0.65	0.66	0.67	0.67	0.68	0.69
Total Waste Management	10.89	9.53	8.07	7.70	7.41	7.08	7.04	7.14	7.15	7.46
Agricultural Sources										
Enteric Fermentation	5.20	5.41	5.09	5.10	5.06	5.00	5.03	5.05	4.97	5.02
Animal Waste	1.89	2.17	2.33	2.29	2.29	2.32	2.33	2.36	2.38	2.41
Rice Cultivation	0.40	0.44	0.47	0.50	0.44	0.47	0.45	0.43	0.47	0.47
Crop Residue Burning	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.05
Total Agricultural Sources	7.54	8.06	7.94	7.94	7.85	7.84	7.86	7.88	7.88	7.96
Industrial Processes	0.12	0.13	0.13	0.13	0.13	0.11	0.11	0.11	0.12	0.11
Total	30.51	29.24	27.38	26.80	26.57	25.99	26.10	26.18	26.37	26.60

P = preliminary data.

Notes: Data in this table are revised from the data contained in the previous EIA report, *Emissions of Greenhouse Gases in the United States 2004*, DOE/EIA-0573(2004) (Washington, DC, December 2005). Totals may not equal sum of components due to independent rounding.

Sources: Published and unpublished data used to produce *Emissions of Greenhouse Gases in the United States 2004*. Emissions calculations based on Intergovernmental Panel on Climate Change, *Greenhouse Gas Inventory Reference Manual: Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, Vol. 3 (Paris, France, 1997), pp. 4.83-4.84, web site www.ipcc.ch/pub/guide.htm; and U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2004*, EPA-430-R-06-002 (Washington, DC, April 2006), web site <http://yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenterPublicationsGHGEmissionsUSEmissionsInventory2006.html>.

Table 16. U.S. Methane Emissions from Coal Mining and Post-Mining Activities, 1990, 1995, and 1998-2005

Source	1990	1995	1998	1999	2000	2001	2002	2003	2004	P2005
Million Metric Tons Carbon Dioxide Equivalent										
Surface Mining										
Mining	9.8	10.3	11.4	11.5	11.4	12.1	12.0	11.7	12.1	12.4
Post-Mining	0.9	0.9	1.0	1.0	1.0	1.1	1.0	1.0	1.1	1.1
Subtotal	10.7	11.2	12.4	12.5	12.4	13.2	13.0	12.7	13.1	13.5
Underground Mining										
Ventilation (Gassy Mines) ^a	48.9	43.9	41.5	40.6	38.3	37.2	34.7	33.4	36.3	33.6
Ventilation (Nongassy Mines)	0.6	0.8	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8
Degasification Systems	28.9	27.8	21.8	17.5	19.8	21.7	22.3	22.1	21.9	21.6
Post-Mining	14.7	13.7	14.5	13.6	12.9	13.2	12.4	12.2	12.7	12.8
Methane Recovery for Energy (-) ..	6.1	13.6	15.5	13.6	16.2	18.0	19.0	16.9	17.5	16.7
Subtotal	87.0	72.5	63.2	58.9	55.7	54.9	51.1	51.5	54.2	52.1
Net Emissions	97.7	83.8	75.6	71.5	68.1	68.0	64.1	64.2	67.3	65.5
Million Metric Tons Methane										
Surface Mining										
Mining	0.43	0.45	0.49	0.50	0.49	0.53	0.52	0.51	0.53	0.54
Post-Mining	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.04	0.05	0.05
Subtotal	0.46	0.49	0.54	0.54	0.54	0.57	0.57	0.55	0.57	0.59
Underground Mining										
Ventilation (Gassy Mines) ^a	2.13	1.91	1.80	1.76	1.67	1.62	1.51	1.45	1.58	1.46
Ventilation (Nongassy Mines)	0.03	0.03	0.04	0.04	0.04	0.04	0.03	0.03	0.04	0.03
Degasification Systems	1.26	1.21	0.95	0.76	0.86	0.94	0.97	0.96	0.95	0.94
Post-Mining	0.64	0.60	0.63	0.59	0.56	0.57	0.54	0.53	0.55	0.55
Methane Recovery for Energy (-) ..	0.26	0.59	0.67	0.59	0.70	0.78	0.83	0.74	0.76	0.72
Subtotal	3.78	3.15	2.75	2.56	2.42	2.38	2.22	2.24	2.36	2.26
Net Emissions	4.25	3.64	3.29	3.11	2.96	2.96	2.79	2.79	2.93	2.85

^aA "gassy" mine is an underground mine with ventilation emissions of 100,000 cubic feet of methane or more per day, as measured by the U.S. Mine Safety and Health Administration.

P = preliminary data.

Notes: Data in this table are revised from the data contained in the previous EIA report, *Emissions of Greenhouse Gases in the United States 2004*, DOE/EIA-0573(2004) (Washington, DC, December 2005). Totals may not equal sum of components due to independent rounding.

Sources: Published and unpublished data used to produce *Emissions of Greenhouse Gases in the United States 2004*. Coal production numbers from Energy Information Administration, *Coal Production*, DOE/EIA-0118 (Washington, DC, various years), and *Coal Industry Annual*, DOE/EIA-0584 (Washington, DC, various years). Methane recovery rates from U.S. Environmental Protection Agency, Office of Air and Radiation, Non-CO₂ Gases and Sequestration Branch, Coalbed Methane Outreach Program. Ventilation data for 1985, 1988, and 1990 provided by G. Finfinger, U.S. Department of the Interior, Bureau of Mines, Pittsburgh Research Center. Ventilation data for all other years provided by U.S. Environmental Protection Agency, Office of Air and Radiation, Non-CO₂ Gases and Sequestration Branch, Coalbed Methane Outreach Program.

Table 17. U.S. Methane Emissions from Natural Gas Systems, 1990, 1995, and 1998-2005

Source	1990	1995	1998	1999	2000	2001	2002	2003	2004	P2005
Million Metric Tons Carbon Dioxide Equivalent										
Production	33.8	36.1	38.4	37.3	39.9	42.0	42.4	42.9	43.5	43.1
Natural Gas Processing	14.9	16.5	16.0	16.1	16.4	16.0	15.5	14.4	14.8	14.5
Transmission and Storage	48.3	49.3	51.0	52.8	55.4	49.0	55.6	54.7	53.7	53.8
Distribution	32.0	35.7	38.5	38.0	39.3	40.0	40.5	41.2	42.6	42.6
Total	128.9	137.6	143.9	144.2	151.0	147.0	154.0	153.2	154.7	154.0
Natural Gas STAR Reductions ..	0.3	5.0	10.4	12.2	14.7	18.2	22.4	24.2	29.2	34.7
Million Metric Tons Methane										
Production	1.47	1.57	1.67	1.62	1.73	1.83	1.84	1.87	1.89	1.87
Natural Gas Processing	0.65	0.72	0.69	0.70	0.71	0.69	0.67	0.63	0.65	0.63
Transmission and Storage	2.10	2.14	2.22	2.30	2.41	2.13	2.42	2.38	2.34	2.34
Distribution	1.39	1.55	1.67	1.65	1.71	1.74	1.76	1.79	1.85	1.85
Total	5.60	5.98	6.26	6.27	6.57	6.39	6.70	6.66	6.73	6.70
Natural Gas STAR Reductions ..	0.01	0.22	0.45	0.53	0.64	0.79	0.97	1.05	1.27	1.51

P = preliminary data.

Notes: Data in this table are revised from the data contained in the previous EIA report, *Emissions of Greenhouse Gases in the United States 2004*, DOE/EIA-0573(2004) (Washington, DC, December 2005). Totals may not equal sum of components due to independent rounding. Data for Natural Gas STAR reductions are estimates provided by the EPA, based on annual submissions to the EPA by companies participating in the program, which report activities undertaken to avoid methane emissions from natural gas and petroleum systems.

Sources: Published and unpublished data used to produce *Emissions of Greenhouse Gases in the United States 2004*; National Risk Management Research Laboratory, *Methane Emissions From the Natural Gas Industry*, Vol. 2, Technical Report, GRI-94/0257.1 and EPA-600-R-96-08 (Research Triangle Park, NC, June 1996); Appendix A; American Gas Association, *Gas Facts* (various years); Energy Information Administration, *Natural Gas Annual*, DOE/EIA-0131 (various years); Energy Information Administration, *Monthly Energy Review*, DOE/EIA-0035(2005/07) (Washington, DC, July 2005); and Energy Information Administration, *Petroleum Supply Annual*, DOE/EIA-0340 (Washington, DC, various years).

Table 18. U.S. Methane Emissions from Petroleum Systems, 1990, 1995, and 1998-2005

Source	1990	1995	1998	1999	2000	2001	2002	2003	2004	P2005
Million Metric Tons Carbon Dioxide Equivalent										
Refineries	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Exploration and Production	29.0	26.1	24.7	23.2	22.9	22.9	22.6	22.4	21.4	20.2
Crude Oil Transportation	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total	29.9	26.9	25.5	24.0	23.8	23.7	23.5	23.3	22.3	21.1
Million Metric Tons Methane										
Refineries	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Exploration and Production	1.26	1.13	1.07	1.01	1.00	0.99	0.98	0.97	0.93	0.88
Crude Oil Transportation	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Total	1.30	1.17	1.11	1.04	1.03	1.03	1.02	1.01	0.97	0.92

P = preliminary data.

Notes: Data in this table are revised from the data contained in the previous EIA report, *Emissions of Greenhouse Gases in the United States 2004*, DOE/EIA-0573(2004) (Washington, DC, December 2005). Totals may not equal sum of components due to independent rounding.

Sources: Published and unpublished data used to produce *Emissions of Greenhouse Gases in the United States 2004*; U.S. Environmental Protection Agency, Office of Air and Radiation, *Draft Estimates of Methane Emissions from the U.S. Oil Industry* (Draft Report, Washington, DC); Energy Information Administration, *Petroleum Supply Annual*, DOE/EIA-0340 (Washington, DC, various years); and *Oil and Gas Journal*, Worldwide Refining Issue and Pipeline Economics Issue (various years).

Table 19. U.S. Methane Emissions from Stationary Combustion Sources, 1990, 1995, and 1998-2005

Source	1990	1995	1998	1999	2000	2001	2002	2003	2004	P2005
Thousand Metric Tons Carbon Dioxide Equivalent										
Residential										
Coal	*	*	*	*	*	*	*	*	*	*
Fuel Oil ^a	113	105	89	96	105	105	99	105	107	108
Natural Gas	100	110	103	107	113	108	111	116	111	110
LPG	10	11	12	14	15	14	14	14	14	14
Wood	11,763	10,546	7,707	8,112	8,721	7,504	7,707	8,112	8,315	8,518
Total	11,986	10,772	7,911	8,329	8,953	7,731	7,932	8,347	8,547	8,749
Commercial										
Coal	29	27	23	24	20	21	21	19	23	23
Fuel Oil ^a	16	12	9	9	10	10	9	11	11	12
Natural Gas	71	83	82	83	86	83	86	87	85	83
LPG	2	2	2	3	3	3	3	2	3	2
Wood	4	5	4	5	5	5	5	5	5	3
Total	122	128	121	122	124	120	123	124	127	124
Industrial										
Coal	150	136	123	121	125	122	112	113	114	109
Fuel Oil ^a	32	27	20	18	21	18	17	19	21	23
Natural Gas	263	298	303	291	295	270	274	264	265	242
LPG	51	64	65	71	72	65	70	67	69	65
Wood	89	102	99	100	101	89	86	84	91	89
Total	585	626	610	601	613	564	559	547	560	528
Electric Power										
Coal	225	242	267	268	281	273	275	280	282	288
Fuel Oil ^a	18	10	16	14	17	17	11	14	14	14
Natural Gas	7	10	10	11	12	12	13	12	12	13
Wood	1	*	*	*	*	*	*	*	*	*
Total	251	262	293	293	309	302	298	306	309	315
Total All Sectors										
Coal	405	405	413	412	426	416	408	412	419	420
Fuel Oil ^a	179	154	134	137	152	150	137	149	154	157
Natural Gas	441	500	499	492	505	473	484	479	474	449
LPG	62	77	78	88	90	82	87	83	86	81
Wood	11,857	10,652	7,810	8,217	8,826	7,597	7,797	8,201	8,411	8,610
Total	12,944	11,788	8,934	9,346	9,999	8,717	8,912	9,324	9,542	9,716

*Less than 500 metric tons carbon dioxide equivalent.

^aFuel oil use in the residential sector consists of distillate fuel only. In the other sectors it includes both distillate and residual fuel oil.

P = preliminary data.

See notes and sources at end of table.

Table 20. U.S. Methane Emissions from Mobile Sources, 1990, 1995, and 1998-2005

Source	1990	1995	1998	1999	2000	2001	2002	2003	2004	P2005
Thousand Metric Tons Carbon Dioxide Equivalent										
Motor Vehicles										
Passenger Cars	3,284	2,234	2,018	1,991	1,955	1,912	1,841	1,708	1,695	1,661
Buses	21	24	26	28	28	26	25	25	25	25
Motorcycles	92	94	99	102	101	93	92	92	97	97
Light-Duty Trucks	1,402	1,630	1,686	1,651	1,625	1,595	1,578	1,541	1,640	1,695
Other Trucks	271	330	363	375	380	387	397	403	419	419
Total	5,070	4,311	4,192	4,148	4,089	4,013	3,934	3,769	3,875	3,897
Other Transport	515	510	460	481	505	476	469	421	500	604
Total Transport	5,585	4,820	4,653	4,628	4,594	4,489	4,403	4,190	4,375	4,500
Thousand Metric Tons Methane										
Motor Vehicles										
Passenger Cars	143	97	88	87	85	83	80	74	74	72
Buses	1	1	1	1	1	1	1	1	1	1
Motorcycles	4	4	4	4	4	4	4	4	4	4
Light-Duty Trucks	61	71	73	72	71	69	69	67	71	74
Other Trucks	12	14	16	16	17	17	17	18	18	18
Total	220	187	182	180	178	174	171	164	168	169
Other Transport	22	22	20	21	22	21	20	18	22	26
Total Transport	243	210	202	201	200	195	191	182	190	196

P = preliminary data.

Notes: Data in this table are revised from the data contained in the previous EIA report, *Emissions of Greenhouse Gases in the United States 2004*, DOE/EIA-0573(2004) (Washington, DC, December 2005). Totals may not equal sum of components due to independent rounding.

Sources: Published and unpublished data used to produce *Emissions of Greenhouse Gases in the United States 2004*. For passenger cars and light-duty trucks, 1990-2000 vehicle miles traveled (VMT) data are based on 2002 data on vehicle stocks provided by R.L. & Polk Co., with VMT modified by Oak Ridge National Laboratory (ORNL), *Transportation Energy Data Book: Edition 23* (Oak Ridge, TN, October 2003), Chapter 7. 1996-2000 data were further adjusted using fleet data and survival curves for the population of aging vehicles. For years after 2000, emissions data are based on fleet data, econometrically modeled VMT, and survival curves for the population of aging vehicles. Calculations for buses, motorcycles, and other trucks are based on VMT from Federal Highway Administration, U.S. Department of Transportation, *Federal Highway Statistics*, Table VM-1 (various years). Vehicle emissions coefficients are from Intergovernmental Panel on Climate Change, *Greenhouse Gas Inventory Reference Manual: Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, Vol. 3 (Paris, France, 1997), pp. 1.65-1.75, web site www.ipcc.ch/pub/guide.htm. Fuel consumption data for non-highway sources are from Energy Information Administration, *Fuel Oil and Kerosene Sales*, DOE/EIA-0535 (Washington, DC, various years); Energy Information Administration, *Petroleum Supply Annual*, DOE/EIA-0340 (Washington, DC, various years), and ORNL, *Transportation Energy Data Book: Edition 23* (Oak Ridge, TN, October 2003), Chapter 9, web site www.cta.ornl.gov/data/chapter9.html.

Table 21. U.S. Methane Emissions from Landfills, 1990, 1995, and 1998-2005

Type	1990	1995	1998	1999	2000	2001	2002	2003	2004	P2005
Million Metric Tons Carbon Dioxide Equivalent										
Gross Emissions from MSW Landfills ..	172.3	169.8	167.1	166.3	166.2	166.5	169.2	173.6	179.0	185.0
Emissions from Industrial Landfills	16.9	16.5	16.0	15.8	15.9	16.0	16.3	16.8	17.5	18.2
Methane Recovered for Energy (-)	15.6	22.6	37.5	41.7	46.4	51.7	54.5	58.1	61.6	64.9
Methane Assumed Flared (-)	6.0	24.6	35.5	36.7	40.6	44.6	47.9	50.6	57.5	57.5
Net Emissions	237.3	204.9	170.9	162.4	155.4	147.8	146.7	148.7	148.8	155.7
Million Metric Tons Methane										
Gross Emissions from MSW Landfills ..	10.52	10.25	9.91	9.78	9.85	9.92	10.12	10.46	10.89	11.30
Emissions from Industrial Landfills	0.74	0.72	0.69	0.68	0.69	0.69	0.71	0.73	0.76	0.79
Methane Recovered for Energy (-)	0.68	0.98	1.63	1.81	2.02	2.25	2.37	2.52	2.68	2.82
Methane Assumed Flared (-)	0.26	1.07	1.55	1.60	1.77	1.94	2.08	2.20	2.50	2.50
Net Emissions	10.32	8.91	7.43	7.06	6.75	6.42	6.38	6.47	6.47	6.77

P = preliminary data.

Notes: Data in this table are revised from the data contained in the previous EIA report, *Emissions of Greenhouse Gases in the United States 2004*, DOE/EIA-0573(2004) (Washington, DC, December 2005). Totals may not equal sum of components due to independent rounding.

Sources: Published and unpublished data used to produce *Emissions of Greenhouse Gases in the United States 2004*. Municipal solid waste landfilled in 2002 from "Nationwide Survey: The State of Garbage in America," *Biocycle* (January 2004). Municipal solid waste generated and landfilled in previous years from "Nationwide Survey: The State of Garbage in America," *Biocycle* (various years), adjusted on the basis of residential demolitions, to reflect exclusion of construction and demolition waste as in the 2002 data. Municipal waste landfilled in 2003 based on 2002 estimate, scaled to annual economic growth. Emissions calculations based on S.A. Thorneloe et al., "Estimate of Methane Emissions from U.S. Landfills," Prepared for the U.S. Environmental Protection Agency, Office of Research and Development (April 1994), and D. Augenstein, "The Greenhouse Effect and U.S. Landfill Methane," *Global Environment Change* (December 1992), pp. 311-328. Methane recovered and flared from U.S. Environmental Protection Agency, Landfill Methane Outreach Program, web site www.epa.gov/lmopl. Emissions from industrial landfills estimated at 7 percent of methane emissions from municipal solid waste landfills, based on U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2004*, EPA-430-R-06-002 (Washington, DC, April 2006), web site <http://yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenterPublicationsGHGEmissionsUSEmissionsInventory2006.html>.

Table 22. U.S. Methane Emissions from Enteric Fermentation in Domesticated Animals, 1990, 1995, and 1998-2005

Animal Type	1990	1995	1998	1999	2000	2001	2002	2003	2004	P2005
Million Metric Tons Carbon Dioxide Equivalent										
Cattle	113.6	118.7	111.5	111.8	110.9	109.7	110.3	110.8	108.9	110.0
Swine	1.6	1.8	1.9	1.9	1.8	1.8	1.9	1.9	1.9	1.9
Sheep	2.1	1.6	1.4	1.3	1.3	1.3	1.2	1.1	1.1	1.1
Goats	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.3
Horses	2.1	2.1	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2
Total	119.6	124.4	117.2	117.3	116.3	115.1	115.8	116.1	114.2	115.6
Million Metric Tons Methane										
Cattle	4.94	5.16	4.85	4.86	4.82	4.77	4.80	4.82	4.73	4.78
Swine	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Sheep	0.09	0.07	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05
Goats	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Horses	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10
Total	5.20	5.41	5.09	5.10	5.06	5.00	5.03	5.05	4.97	5.02

P = preliminary data.

Notes: Data in this table are revised from the data contained in the previous EIA report, *Emissions of Greenhouse Gases in the United States 2004*, DOE/EIA-0573(2004) (Washington, DC, December 2005). Totals may not equal sum of components due to independent rounding.

Sources: Published and unpublished data used to produce *Emissions of Greenhouse Gases in the United States 2004*. Cattle, sheep, and pig population data provided by the U.S. Department of Agriculture, National Agricultural Statistics Service, Livestock, Dairy and Poultry Service. Goat and horse population figures extrapolated from U.S. Department of Commerce, Bureau of the Census, *Census of Agriculture*, 1982, 1987, 1992, and 1997. Emissions calculations based on U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2004*, EPA-430-R-06-002 (Washington, DC, April 2006), web site <http://yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenterPublicationsGHGEmissionsUSEmissionsInventory2006.html>; and P.J. Crutzen, I. Aselmann, and W.S. Seiler, "Methane Production by Domestic Animals, Wild Ruminants, Other Herbivorous Fauna, and Humans," *Tellus*, Vol. 38B (1986), pp. 271-284.

Table 23. U.S. Methane Emissions from the Solid Waste of Domesticated Animals, 1990, 1995, and 1998-2005

Animal Type	1990	1995	1998	1999	2000	2001	2002	2003	2004	P2005
Thousand Metric Tons Carbon Dioxide Equivalent										
Cattle										
Beef Cattle	4,037	4,838	4,592	4,547	4,496	4,470	4,454	4,433	4,406	4,455
Dairy Cattle	12,717	15,236	16,970	17,092	17,430	17,746	18,014	18,185	18,267	18,544
Swine										
Market Swine	19,222	21,368	23,366	22,522	22,368	22,627	22,724	23,165	23,522	23,713
Breeding Swine	3,502	3,788	3,739	3,488	3,507	3,470	3,390	3,362	3,340	3,364
Poultry										
Layers	1,663	1,814	1,913	1,979	2,016	2,052	2,076	2,082	2,114	2,132
Broilers	1,590	2,158	2,298	2,372	2,255	2,284	2,339	2,312	2,379	2,415
Other Animals										
Sheep	115	34	29	28	27	27	25	24	24	24
Goats	16	15	12	11	11	12	10	10	10	23
Horses	624	631	644	636	645	652	652	652	652	652
Total	43,486	49,883	53,563	52,676	52,756	53,340	53,684	54,225	54,715	55,320
Thousand Metric Tons Methane										
Cattle										
Beef Cattle	176	210	200	198	195	194	194	193	192	194
Dairy Cattle	553	662	738	743	758	772	783	791	794	806
Swine										
Market Swine	836	929	1,016	979	973	984	988	1,007	1,023	1,031
Breeding Swine	152	165	163	152	152	151	147	146	145	146
Poultry										
Layers	72	79	83	86	88	89	90	91	92	93
Broilers	69	94	100	103	98	99	102	101	103	105
Other Animals										
Sheep	5	1	1	1	1	1	1	1	1	1
Goats	1	1	1	*	*	1	*	*	*	1
Horses	27	27	28	28	28	28	28	28	28	28
Total	1,891	2,169	2,329	2,290	2,294	2,319	2,334	2,358	2,379	2,405

*Less than 500 metric tons methane.

P = preliminary data.

Notes: Data in this table are revised from the data contained in the previous EIA report, *Emissions of Greenhouse Gases in the United States 2004*, DOE/EIA-0573(2004) (Washington, DC, December 2005). Totals may not equal sum of components due to independent rounding.

Sources: Published and unpublished data used to produce *Emissions of Greenhouse Gases in the United States 2004*. Population data for horses and goats extrapolated from U.S. Department of Commerce, Bureau of the Census, *Census of Agriculture*, 1982, 1987, 1992, and 1997. Population data for all other animals from U.S. Department of Agriculture, National Agricultural Statistics Service, Livestock, Dairy and Poultry Branch. Typical animal sizes from U.S. Environmental Protection Agency, Office of Air and Radiation, *Anthropogenic Methane Emissions in the United States: Estimates for 1990, Report to Congress* (Washington, DC, April 1993), p. 6-8; and U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2004*, Table M-2, EPA-430-R-06-002 (Washington, DC, April 2006), web site <http://yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenterPublicationsGHGEmissionsUSEmissionsInventory2006.html>. Cattle sizes adjusted by annual slaughter weight from U.S. Department of Agriculture, National Agricultural Statistics Service, Livestock, Dairy and Poultry Branch. Maximum methane production, and waste management systems used from L.M. Safley, M.E. Casada, et al., *Global Methane Emissions from Livestock and Poultry Manure* (Washington, DC: U.S. Environmental Protection Agency, February 1992), pp. 24-27; U.S. Environmental Protection Agency, *Cost Methodology Report for Beef and Dairy Animal Feeding Operations*, EPA-821-R-01-019 (Washington, DC, January 2001), pp. 1-13-1-14; and U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2002*, EPA-430-R-04-003 (Washington, DC, April 2004), Table M-2. General methane conversion factors from Intergovernmental Panel on Climate Change, *Greenhouse Gas Inventory Reference Manual: Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, Vol. 3 (Paris, France, 1997), p. 4.25, web site www.ipcc.ch/pub/guide.htm. State methane conversion factors for dairy cattle from U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-1998*, EPA-236-R-00-001 (Washington, DC, April 2001); and U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2002*, EPA-430-R-04-003 (Washington, DC, April 2004), Table M-4.

Table 24. U.S. Methane Emissions from Industrial Processes, 1990, 1995, and 1998-2005

Source	1990	1995	1998	1999	2000	2001	2002	2003	2004	P2005
Thousand Metric Tons Carbon Dioxide Equivalent										
Chemical Production										
Ethylene	380	488	540	578	521	470	493	479	535	500
Ethylene Dichloride	58	72	82	91	82	78	78	83	101	94
Styrene	335	475	477	499	452	357	415	437	456	427
Methanol	174	225	262	254	203	142	137	132	123	97
Carbon Black	331	386	407	415	384	363	386	386	386	386
Total	1,277	1,646	1,767	1,837	1,643	1,410	1,509	1,518	1,602	1,504
Iron and Steel Production										
Coke ^a	251	201	163	148	155	130	132	120	108	100
Sinter	141	144	125	127	124	106	104	103	93	96
Pig Iron	1,028	1,053	998	958	991	872	833	841	875	770
Total	1,420	1,399	1,286	1,233	1,271	1,108	1,068	1,065	1,076	967
Total Industrial Processes	2,697	3,044	3,053	3,070	2,914	2,518	2,577	2,582	2,678	2,471
Thousand Metric Tons Methane										
Chemical Production										
Ethylene	17	21	23	25	23	20	21	21	23	22
Ethylene Dichloride	3	3	4	4	4	3	3	4	4	4
Styrene	15	21	21	22	20	16	18	19	20	19
Methanol	8	10	11	11	9	6	6	6	5	4
Carbon Black	14	17	18	18	17	16	17	17	17	17
Total	56	72	77	80	71	61	66	66	70	65
Iron and Steel Production										
Coke ^a	11	9	7	6	7	6	6	5	5	4
Sinter	6	6	5	6	5	5	5	4	4	4
Pig Iron	45	46	43	42	43	38	36	37	38	33
Total	62	61	56	54	55	48	46	46	47	42
Total Industrial Processes	117	132	133	133	127	109	112	112	116	107

^aBased on total U.S. production of metallurgical coke, including non-iron and steel uses.

P = preliminary data.

Notes: Data in this table are revised from the data contained in the previous EIA report, *Emissions of Greenhouse Gases in the United States 2004*, DOE/EIA-0573(2004) (Washington, DC, December 2005). Totals may not equal sum of components due to independent rounding.

Sources: Published and unpublished data used to produce *Emissions of Greenhouse Gases in the United States 2004*; American Iron and Steel Institute, *Annual Statistical Report* (Washington, DC, various years); American Chemical Council (formerly the Chemical Manufacturers Association), *U.S. Chemical Industry Statistical Handbook* (Washington, DC, various years); and Intergovernmental Panel on Climate Change, *Greenhouse Gas Inventory Reference Manual: Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, Vol. 3 (Paris, France, 1997), p. 2.23, web site www.ipcc/pub/guide.htm.